same law of adaptation to objective reality which has controlled the history of animals. This view of the conditions of our existence puts science in its right place. As all sensations are symbols of external reality useful to guide organisms to teleological reactions, so is all science symbolic and similarly useful.

Nature never produces what to us seems a perfect organism, but only organisms which are provided with means of adjustment sufficient to accomplish the survival and perpetuation of the species. Man also is imperfect, but in the struggle for existence wins his way because his consciousness has greater resources than that of any other organism. His great power arises from his appreciation of evolution. His highest duty is to advance evolution, and this duty must be most strongly felt by those who accept the religious interpretation of life. The advancement of science is an obligation. To this view of the work of our Association I may safely claim the assent of all present.

The function of science is to extend our acquaintance with the objective world. The purpose of the American Association is not alone to increase the sum total of science, but equally also to preach by word and precept the value of truth, truth being the correct conscious symbol of the objective, by utilising which our purposeful reactions are improved. The most serious obstacle truth encounters is the prevalence of what I may call "doll ideas," by analogy with the material dolls with which children play. The child "makes believe" with the doll, knowing all the time its unreality, assigns to it hopes, passions, appetites; the child may feel the intensest sympathy with its doll, weep at its sorrows, laugh over its joys, yet know always that it is a mere inanimate, senseless doll. Adult men and women have ideas, with which they play make-believe; doll ideas, which they know are unreal, and yet they mourn sincerely over the adversities of their mental dolls, rejoice over their successes and fight for them with passion. Such doll ideas become mingled with the real and inextricably woven into the fabric of life. They are treated with the most earnest seriousness. Men will fight for them as a child will fight for its doll, not because it is property, but because it is sacred personality. So are doll ideas often made sacred and defended with fanaticism. Yet behind, in consciousness, is the sense of unreality, the disregarded admission of "making believe." Do not doll-ideas—pseudo-opinions—play a great *rôle* in human life? I think they do, and thinking so, deem it all the more imperative that you and others should teach the people the standard of science, the humble acknowledgment of reality. I wish an impulse towards this goal from our Association could be imparted to every man and woman in the country, and I hope the Association may continue to grow in number and power for long years to come, as it has grown in the last few years, so that it shall be a national, all-pervading influence serving the truth.

It seems to me inconceivable that the evolution of animals should have taken place as it actually has taken place, unless consciousness is a real factor and dominant. Accordingly, I hold that it actually affects the vital processes. There is, in my opinion, no possibility of avoiding the conclusion that consciousness stands in immediate causal relations with physiological processes. To say this is to abide by the facts, as at present known to us, and with the facts our conceptions must be made to accord.

The thought which I wish to emphasise is the importance for the future investigation of consciousness of separating the study of what it does from the study of what it is. The latter study is recondite, metaphysical, and carries us far beyond the limits of verifiable human knowledge. The former study is open to us and offers opportunities to science, but it has hitherto been almost completely neglected. Biology has now to redeem itself by effectual researches on consciousness. On the adequate prosecution of such researches we base great hopes.

Before I close, permit me a few words concerning the relations of consciousness to the body, to the living substance through which it manifests itself. It is intimately linked to protoplasm. Probably no question is so profoundly interesting to all mankind as the old question, What is the relation of the mind to the body? It is a question which has been stated in many forms and from many points of view, but the essential object of the question is always the same, to ask whether consciousness is a function of living matter or something discrete and not physical or material.

Throughout this address consciousness has been viewed as a device to regulate the actions of the organism so as to accomplish purposes which on the whole are useful to the organism, and accordingly we have termed its function teleological. If this view is correct, it accounts for the limitations of consciousness, its mechanical mode of work, its precision and definiteness of action, for, of course, unless consciousness is orderly and obeys laws it cannot be of use to the organism, but, on the contrary, it would be harmful, and conscious animals would have ceased long ago to survive. The very fact that consciousness is of such high value in the bionomy of an animal renders it obvious that it must be subject to law. Accordingly it appears to us regulated as do the functions of protoplasm, hence to certain modern thinkers it presents itself as a function of protoplasm, or, as it may be better stated, as a state or condition of protoplasm.

The internal evidence of consciousness, however, is against this view and presents to us conscious actions as depending upon the consciousness. As before stated, I believe this evidence must be accepted. Now all the sensations of consciousness are derived from physical force, and all the acts of consciousness are manifested through physical force, hence if it has any real power consciousness must be able to change the form of energy. Unless we accept this doctrine we must give up all belief in free-will and adopt the automaton theory of life. Is not the more reasonable explanation that which is based upon all the contents of our consciousness rather than that which we can draw only by discarding the internal evidence which consciousness brings us? The hypothesis which I offer for your consideration is this:—

Consciousness has the power to change the form of energy, and is neither a form of energy nor a state of protoplasm.

By this hypothesis there are two fundamentally different things in the universe—force and consciousness. You ask why I do not say three, and add matter? My answer is that we do not have, and never have had, any evidence whatever that matter exists. All our sensations are caused by force, and by force only, so that the biologist can say that our senses bring no evidence of matter. The concept "matter" is an irrational transfer of notions derived from the gross molar world of the senses to the molecular world. Faraday long ago pointed out that nothing was gained and much lost by the hypothesis of material atoms, and his position seems to me impregnable. It would be a great contribution to science to kill off the hypothesis of matter as distinct from force.

To conclude, the universe consists of force and consciousness. As consciousness by our hypothesis can initiate the change of the form of energy, it may be that without consciousness the universe would come to absolute rest. Since I close with a bold speculation, let my last words recall to you that my text is:—Investigate consciousness by comparative observation. Only from observation can we know. Correct, intelligent, exhaustive observation is our goal. When we reach it, human science will be completed.

NOTES.

WE understand from recent Queensland newspapers that it has been determined to abolish the Weather Bureau of that colony as from the 30th ult., and that the services of Mr. C. L. Wragge and his special staff have been dispensed with. In a letter addressed by the Premier of Queensland to the Federal Prime Minister it is pointed out that this apparently retrograde step is owing to the urgent necessity for reducing in every branch of the public service the estimates of expenditure of the State, and that it is one of the "most unfortunate" results of the large deficit in the revenue, brought about by drought and other causes. Prior to federation, the Weather Bureau formed part of the Post and Telegraph Department of Queensland, and all telegrams and correspondence passed free. But during the last fifteen months the Federal Government has charged for these communications at the rate of about 4000*l.* a year, which expense cannot be borne any longer by the Queensland Government. The Premier writes that he feels sure the States in general will welcome any reasonable suggestions for a continuance of the work of the Bureau under federal control; we may therefore hope that the existing instruments and stations will be utilised, as far as practicable, in the interest of meteorological science. Truly the Colonies are in this respect following the mother country, and we may soon expect the Empire, so active in neglecting science, to be the laughing stock of civilised peoples.

THE Copenhagen correspondent of the *Times* reports that the International Conference for Biological and Hydrographical Research, the object of which is to promote ocean research for fishery purposes, was opened there on July 22. Dr. Deuntzer, Danish Foreign Minister, welcomed the delegates, who represented Great Britain, Sweden, Norway, Finland, Russia, Holland, Germany and Denmark. In reply to Dr. Deuntzer's welcome, the British delegate, Sir Colin Scott-Moncrieff, expressed the thanks of the delegates, who, he declared, earnestly hoped that their labours would have fruitful results. Herr Herwig, the German delegate, was elected president of the conference.

IT is stated that Prof. Virchow, who is now staying at Harzburg, is obliged to keep to his room owing to general weakness. His condition is causing uneasiness among his friends.

THE *British Medical Journal* announces that the King of Italy has given 10,000 lire to the Italian Red Cross Society in aid of the campaign against malaria in the Campagna this season. Prof. Postempski will, as formerly, act as director of the medical service organised under the auspices of the Society.

MR. E. B. BAILEY has been appointed a geologist on the Geological Survey of Scotland.

THE death is announced of Prof. Gerhardt, the well-known authority on diseases of the lungs and children's diseases, at his estate of Damberg, in Baden. Prof. Gerhardt, who was born in 1833, held professorships at Jena, Würzburg and Berlin, and was the author of several important medical works.

MR. BENJAMIN MARTELL, whose death we regret to see announced, for more than thirty years played a prominent part in the many important changes which have taken place during that period in connection with the development of ship construction in this country. He was born in 1825, and trained at Portsmouth Dockyard, where he served his time as an apprentice. He joined Lloyd's Register Society in 1856, and in sixteen years, after serving the Society at several of the important shipbuilding centres in the country, was called to the position of chief surveyor, which he held until his retirement in 1899. The tables of freeboard prepared by Mr. Martell, and afterwards placed upon the Statute Book, represent the results of one of the many pieces of work which he successfully carried out for the good of the shipping community.

WE regret to announce the death of Prof. V. Safarik (Schafarik) at the mature age of seventy-three, which took place at Prague on July 2. Prof. Safarik became professor of chemistry in the Bohemian Polytechnicum in 1868. In 1882 he was appointed professor of chemistry in the Bohemian University and in 1892 professor of descriptive astronomy, from which post he retired in 1896. In the fifties and sixties of last century he published several papers in organic chemistry (specific volumes, vanadium, platino-cyanides, &c.), and his last chemical paper was on the constitution of natural silicates, in 1872. Later on he devoted himself to astronomical investigations, which he carried out in his private observatory, and his work on the surfaces of planets, variable stars, &c., is well known to astronomers. He was an adept at grinding and polishing metallic and glass mirrors for reflectors and in silvering the latter. He attended the Bradford meeting of the British Association in 1873, and from that time was often in communication with several leading British astronomers. Those who knew Prof. Safarik personally could not but admire his very wide, almost universal knowledge; indeed, he was one of the last polyhistorians of the Alexander Humboldt school, whose work he translated into the Bohemian language. He has left behind a long series of astronomical observations, which he was prevented by ill-health from publishing.

AT the meeting of the London County Council on Tuesday, the Technical Education Board reported the result of the inquiry by a special subcommittee of the Board as to the need and present provision for special training of an advanced kind in connection with the application of science (especially chemistry and electricity) to industry, and as to what, if any, developments are needed to secure efficient training in these subjects for senior county scholars and other advanced students who desire to qualify themselves to take leading positions in scientific industries. The report of the special subcommittee deals with matters which the Board points out are of great importance to the present and future prosperity of various English industries, notably some connected with London. The members of the special committee came, without a dissentient voice, to the conclusions (1) that England (and London in particular) has suffered the loss of certain industries and that others are in danger; (2) that this loss has been largely due to defective education, especially in the higher grades; and (3) that London is still seriously behind other cities, notably Berlin, in the provision for the higher grades of scientific training and research. The report was accepted, with the addition of the recommendation "that the Technical Education Board be instructed to report as to the steps it proposes to take in order to give practical effect to the suggestions contained in the report."

GRANTS in aid of the following researches were made at a recent meeting of the Board of Trustees of the Elizabeth Thompson Science Fund:—150 dollars to Prof. H. E. Crampton, Columbia University, New York, for experiments on variation and selection in Lepidoptera. 100 dollars to Dr. F. W. Bancroft, University of California, Berkeley, Cal., for experiments on the inheritance of acquired characters. 125 dollars to Dr. J. Weinzirl, University of New Mexico, Albuquerque, N. Mex., for investigation of the relation of climate to the cure of tuberculosis, it being agreed that if the work justifies it the same amount will be granted next year. 300 dollars to Prof. H. S. Grindley, University of Illinois, Urbana, Ill., for investigation of the proteids of flesh. 300 dollars to Dr. H. H. Field, Zürich, Switzerland, to aid the work of the concilium bibliographicum. 250 dollars to Prof. T. A. Jaggar, Harvard University, Cambridge, Mass., for experiments in dynamical geology, provided the secretary receives the necessary assurance that the work can be undertaken with reasonable promptitude. 50 dollars to Dr. E. O. Jordan, University of Chicago, Chicago, Ill., for the study of the bionomics of Anopheles. 300 dollars to Dr. E. Anding, München, Bavaria, to assist the publication of his work "Ueber die Bewegung der Sonne durch den Weltraum," but the grant is conditional upon other means being also secured by the author sufficient to accomplish the publication. 300 dollars to Prof. W. P. Bradley, Wesleyan University, Middletown, Conn., for investigations on matter in the critical state. 300 dollars to Prof. Hugo Kronecker, Bern, Switzerland, for assistance in preparing his physiological researches for publication. 300 dollars to Prof. W. Valentiner, Grossh, Sternwarte, Heidelberg, Germany, to continue the work of Grant No. 93 (observations on variable stars).

IT is reported that a storm of unusual violence, accompanied by torrential rain and a heavy hail shower, broke over the city of Kieff on July 20. A violent cyclone passed over Chalon-sur-Saône on July 15 between 6 p.m. and 7 p.m., blowing down chimneys and trees and sinking several vessels on the River Saône.

We learn from the *Times* that news has been received of a severe earthquake shock at Bandar Abbas on July 9. It commenced at half-past seven in the morning and lasted three or four minutes. All the chief buildings suffered. The Governor's house partly collapsed, while the Customs office was destroyed. The shocks continued in the Persian Gulf on July 9 and 10, and apparently proceeded from Kishm Island. Loud noises at Kishm were distinctly audible at Bandar Abbas. It is feared that the destruction at Kishm is considerable. No further information is available. A few years ago an earthquake at Kishm destroyed hundreds of people. The whole population of Bandar Abbas has flocked to the sea-beach for safety.

A message from the Geneva correspondent of the *Daily Chronicle*, dated July 14, says:—A luminous haze has attended the sunsets lately, as if the whole of the west of Switzerland was on fire and the flames reflected in the sky. Swiss men of science attribute this to the presence of fine dust or ashes in the upper currents of air, and are of opinion that this dust has been carried across the Atlantic from Mont Pelée by air currents. This supposition is given support by the news that after a shower of rain at Frauenfeld, in Canton Thurgau, the ground was covered with a thin layer of ashes of greyish-blue colour.

A telegram from Kingstown, St. Vincent, states that on Thursday last, July 17, several shocks of earthquake were felt there, a terrific shock being experienced at a quarter to ten in the morning, accompanied by a loud rumbling explosive sound like thunder. The worst shock lasted only ten seconds. The shocks were probably caused by explosions of subterranean gas or steam. A few days ago it was reported that the saddle between the two craters of the Soufrière had collapsed, throwing thousands of cubic feet of sand, scoriæ and rock into the funnel of the Soufrière, thus blocking the throat of the crater. In consequence of this, it is suggested that the gas and steam, failing to find any outlet by the throat or funnel of the mountain, caused internal explosions and severe concussions. A *Times* message from St. Thomas states that a severe earthquake was felt in St. Vincent on July 22 at 1.15 in the morning. The shocks were local, and seem to have been confined to a certain area of which Kingstown and its vicinity were apparently the centre.

It would seem to be the universal belief that volcanic ash has very fertilising qualities, and Prof. d'Albuquerque's contrary view, as a result of the first examination of the St. Vincent ash which fell at Barbados early in May last, was generally regarded with suspicion. The latest number of the West Indian *Agricultural News* contains an interesting paragraph on the subject. Analyses by different authorities in the West Indies and in England showed conclusively, as Prof. Harrison said, "that the volcanic dust was quite valueless as a manure—the value of the soluble constituents being about three cents." Owing to the copious rains that fell in Barbados immediately after the dust, causing a sudden bursting of leaf and flower on plants that had previously been parched by drought, a popular idea was fostered that the dust was, more or less, of a fertilising character. It is believed, probably on good grounds, that it was useful in destroying the small black ants common in the island, and in drying up the egg-clusters of the moth-borer then on the leaves of the sugar-cane.

Mr. H. Hesketh Bell, Administrator of Dominica, has a long letter in Tuesday's *Times*, in which he shows that the effects of the recent volcanic eruptions in Martinique and St. Vincent have been greatly exaggerated in many reports. No attempt is made to minimise the disaster, but only to show that the area involved in it is comparatively small. Even estimating the devastated area in Martinique at fifty square miles, there still remain more than 300 square miles in that island that are practically in exactly the same condition as they were in the day before the eruption. With the exception of the blasted triangle on the western slope of Pelée, the whole colony is still dotted with plantations, homesteads and villages. St. Vincent has also suffered, but there are still 43,000 colonists in the island. No other islands have been affected. Although, as has correctly been stated, many of the Leeward and Windward Islands possess craters and volcanic cones, there has so far not been in any of them the slightest sympathetic activity with the outbursts in Martinique and St. Vincent. The fall of volcanic dust that has been noticed in many of the islands has simply been a harmless phenomenon, and, so far as sympathetic volcanic agency may be concerned, it is said that the islands might just as well have been thousands of miles away from the affected craters. Dominica is in precisely the same prosperous condition that it was in the day before the eruptions at Martinique and St. Vincent. Although barely forty miles distant from Pelée and near enough for the inhabitants to hear the detonations, Mr. Bell says the island has been absolutely unaffected by the recent outburst. The hot springs and geysers have remained in their normal condition, and, with the exception of one slight shock of earthquake felt by a few persons, there has not been any seismic disturbance. Even the shower of powdered scoriæ that fell on May 11 was so slight that its presence could only be detected on the surface of palm-leaves and other large foliage.

A correspondent sends us from Bath a drawing of a rathe curious development of a foxglove (digitalis). The plant represented was similar to any ordinary foxglove, with the exception that the terminal flower of each inflorescence was not a foxglove blossom, but a Canterbury bell (campanula). This flower, from an external view, looked like any normal Canterbury bell; the stamens, however, were eight in number and similar to those of the foxglove, while the pistil was somewhat like that common to the foxglove. A botanist to whom we submitted the drawing and description tells us he obtained a photograph of the same kind of flower some years ago, and upon inquiry he found that the anomaly is fairly frequent and well known. The combination of two flowers other than the foxglove and campanula, if it occurs, would, however, be worth recording. The specimen from which the photograph mentioned was taken grew in a semi-wild garden in Surrey not far from London.

The use of oxygen inhalers in connection with high balloon ascents was mentioned last week (p. 279). On the occasion of the last Aëronautical Congress held at Berlin, a report on the inhalation of oxygen was presented, and the subject has also occupied the attention of the Société française de Navigation aérienne. The July number of the *Aëronautical Journal* contains a report of a lecture delivered by Dr. Süring before this Society upon his ascent with Dr. Berson on July 31, 1901, when the height of 10,800 metres was reached. It was pointed out that as to the physiological side of the question, on closely studying foreign and German ascents, three stages may be distinguished. During the first of these stages the excitement exceeds considerably the phenomena of height-sickness proper, resulting from want of oxygen. In such a state of excitement, one does not know, perhaps, the real state of the height-sickness, and this naturally becomes an exceedingly critical matter when the dangers of a mishap become imminent. The regrettable issue of the *Zenith* expedition in the year 1874 is no doubt to be traced to this, to a large extent at any rate. The second and more dangerous stage is that of confusion. By systematically inhaling oxygen, this state of excitement leading to confusion and imminently dangerous conduct can be warded off by aëronauts of ordinarily cool disposition; whereas it is evident that a state of enervation with signs of relaxation cannot be completely prevented. Notes are illegibly written in the wrong place, the eyes refuse their services, the slightest exertion results in a dangerous weakness, and, finally, the whole organism falls a victim to an inevitable need for sleep. But, also these illnesses may yet be overcome to a certain extent if greater precautions are taken in future ascents, if the aëronaut avoids all exertions, all excitement, sleeps sufficiently, undergoes a still more systematic inhaling of oxygen, begins earlier with it and protects himself sufficiently against cold.

Perhaps the most singular statement in the Meteorological Office pilot chart for the month of August is that relating to the appearance, early in July, of a fairly large ice floe, 40 feet by 15 feet and a foot out of water, off the west of Scotland, close inshore on the Treshnish Islands, on the west side of Mull, and only a few miles from Tobermory. From other sources it appears that the fishermen who saw it could not be mistaken, as they sailed within 20 feet of the floe. It was reported by independent observers on two days. There can be little doubt that it was the remains of one of the icebergs which had for some time been infesting the coast of Iceland, but it would be interesting to trace its movements southward. Off Mull it was travelling in a north-easterly direction, so it is reasonable to suppose that it had at first drifted southward outside the Hebrides before the northerly winds which prevailed so long earlier in the season. While we have had this quite exceptional circumstance on our side of the Atlantic, the ice record about the Newfoundland banks remains almost blank. Three or four observers report a berg in about 48° N., 49° W., and there was one in 42° 40′ N., 47° 30′ W. The strait of Belle Isle had been clear of ice until about the end of June, but early in July several bergs had drifted in past Belle Isle. There was, however, nothing like the usual quantity at this time of the year, and shipmasters appear to have seen nothing of the heavy ice of a month earlier, which was reported to block the approaches to the strait. This freedom from ice probably explains the excess in the temperature of the sea surface on the banks and over an extensive region eastward and westward during the month of May last, the results of which, derived from 4400 observations, are shown on an inset chart.

An interesting review of recent work in wireless telegraphy is commenced in *L'Eclairage Électrique* for July 5. The article is by M. Turpain, himself a worker in this field. It is noteworthy that the author is unable to credit Mr. Marconi's having succeeded in signalling across the Atlantic, and attributes the signals received at Newfoundland to atmospheric effects. No reference to the later experiments on the *Philadelphia* is made. M. Turpain also quotes evidence to show that the successful solution of the syntony problem has not as yet been found by Mr. Marconi. Prof. Slaby's system and the experiments with a repeater made by M. Guarini are also described in this instalment.

The *Journal de Physique* for June contains an article by M. Armagnat on the study of resonance by means of oscillographs. The paper deals with the subject both theoretically and experimentally. The method has been devised because the wave forms obtained by means of an oscillograph, or other wave-tracing instrument, are not accurate enough to allow of the harmonics being found by means of graphical analysis. Two oscillographs are used, one in series with a non-inductive resistance tracing the wave-form under examination; the other is in series with a variable self-induction and capacity which are altered until the different harmonics are resonated and traced on the screen. The paper is illustrated by some interesting curves obtained in this manner, one of which shows how the method may be used to measure the irregularities in the speed of an alternator.

In the "Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam (Tweede Sectie)," Deel ix. pp. 1–12, Dr. P. H. Eykman has published an interesting paper describing a method for obtaining a Röntgen photograph of an internal part of the living body during the performance of a definite functional movement. The author applies the method to the investigation of the motion of the tongue, pharynx and larynx in swallowing. He fixes a contact on the Adam's apple, the motion of which closes the current which feeds the Röntgen tube at a perfectly definite moment during the motion. The motion has to be repeated 120 or 130 times with the contact in exactly the same position in order to obtain a distinct photograph. Other photographs of different phases of the motion are obtained by altering the position of the contact. The photographs are good considering the difficulties of the experiment and throw a welcome light on the position of the epiglottis and on the condition of the upper opening of the larynx during the act of deglutition.

Alcohol as a motive power has formed an interesting set of experiments in France at the present time, the object being to produce a home-made substitute for petrol, which all has to be imported. According to *Feilden's Magazine* for July the results obtained are of a satisfactory nature, both for the heavier and lighter types of cars, and it is stated that passenger cars driven by alcoholic traction have been proved to hold their own against those with petrol as a motive power. The price of alcohol at present is higher, but by the use of beetroot in its manufacture its market value has been greatly reduced. The experiments showed that the amount of alcohol consumed by the engines (which were designed to burn petrol) was 50 per cent higher than that of petrol, but it is stated that with engines properly constructed to use the new motive power this difference would be greatly reduced, and should this be the case it will form a home-made motor-car spirit to replace the imported article. Attention is also directed to the ease with which it can be prepared from potatoes, and consequently, on account of its general utility for heating, lighting, &c., it would seem that an opportunity is open for Ireland to create a most important industry.

Mr. M. L. Sykes has favoured us with a copy of his paper on the evolution of butterfly-scales, published in the *Report and Transactions* of the Manchester Microscopical Society for 1901. The illustrations show that the scales of butterflies which mimic other species are generally quite different in form from those of the species mimicked.

According to a photograph, taken from a living example, of which a reproduction is given by Dr. Jentink in *Notes* from the Leyden Museum for July, the form given to the nose in mounted specimens and figures of the proboscis-monkey of Borneo is quite incorrect. Instead of being sharply pointed, compressed, and projecting straight forwards, this appendage is expanded and depressed at the extremity, which hangs down in front of the upper jaw so as to conceal the greater part of the mouth in a full-face view.

Marine fish-destroyers form the subject of an article by Prof. W. C. McIntosh in the May number of *Harper's Magazine*, in the course of which the chief types of extinct and living marine monsters destructive to sea-fish are described and illustrated. The author considers that such destroyers have done much more harm than man to food-fishes, and suggests that little good is done by regulations for controlling sea-fisheries.

Whether he is justified in classing the freshwater labyrinthodonts as marine fish-destroyers may be open to question; and his statement that the American Devonian fish Dinichthys occurs in the English "Old Red" does not appear to rest on good foundation. Why he should say that plesiosaurs "*continued* to the Mesozoic" is hard to understand; and his estimate of the size of the dinosaurian Atlantosaurus (100 feet long and 30 feet high) appears a gross exaggeration.

To the *Notes* from the Leyden Museum Dr. R. Horst contributes some remarks on the habits of the cocoanut-crab, based upon observations made on captive specimens at Batavia and living examples near Bantam by Mr. C. P. Sluiter. Recently some doubts have been expressed as to whether it is in the habit of ascending palm-trees. Mr. Sluiter has, however, seen these crabs climb to the top of mangrove-trees and palms fully 60 feet in height. What they did when at the top he was unable to ascertain, but, from observations made on captive specimens, he considers it probable that they were engaged in opening young cocoa-nuts and devouring their contents. Whether they have the power of opening ripe cocoanuts could not be determined, the specimens under observation merely fumbling such as were given them without attempting to penetrate the shell.

At the conclusion of a memoir on the structure of the retina of the eye, published in the *Quarterly Journal of Microscopical Science* for July, Mr. H. M. Bernard states that this structure can no longer be regarded as being built up of a number of distinct cells, each of which possesses distinct and definite functions. On the contrary, if distinct cells ever exist, their walls must be broken down at a very early stage of development. In technical terms, the retina is a continuous cytoplasmic reticulum containing non-stationary embedded nuclei. The other papers in the same serial include one by Mr. H. J. Fleure on the relations of the kidneys in Haliotis, and a second, by Miss I. Drummond, on the development of Paludina.

In most seismographs, the records are made on a sheet of glass or strip of paper which is either set in motion by an earthquake or has an ordinarily slow velocity increased at a somewhat advanced phase of the shock. In either case the interesting preliminary tremors are more or less completely lost. During the last three years, however, Dr. Cancani has avoided this loss by keeping the strip of paper continuously moving at the rate of six metres an hour. This velocity he has shown to be sufficient to decipher vibrations with a period of one-twentieth of a second and therefore above the lower limit of audibility. In a paper recently published (*Boll. Soc. Sismol. Ital.*, vol. vii. pp. 292–298), he maintains that even this velocity may be conveniently increased to one ten times as great and therefore capable, so far as speed is concerned, of registering the vibrations of earthquake-sounds occurring at the rate of 200 per second.

A worthy notice of the life and scientific work of the late Prof. P. G. Tait is contributed to the *Physical Review* (July) by Mr. A. Macfarlane, and is accompanied by a portrait of Tait printed in photogravure on plate paper.

Messrs. Crosby Lockwood and Son have ready for publication a volume entitled "Aërial Navigation," by Mr. Frederick Walker, dealing with the construction of dirigible balloons and other flying-machines; and another on the "Elements of Agricultural Geology," by Mr. P. McConnell.

In the abstract of the paper on refractive indices by Mr. J. W. Gifford, published in Nature of July 17 (p. 287), line 12 reads, "The difference of the angles of the prisms from 60° were in each case *less than* 4 *seconds of arc*." Mr. Gifford informs us he should have said, "*less than* 4 *minutes of arc*."

An interesting essay on "Clouds and Weather Signs," by Commander D. Wilson-Barker, has been reprinted from *Knowledge* and issued as an illustrated brochure. The pictures of clouds which the publication contains are exceptionally fine, and the descriptions of them should be the means of increasing the number of scientific observers of cloud phenomena.

In the article on "Some New Forms of Geodetical Instruments" which appeared in last week's Nature, it should have been mentioned that the illustrations of the instruments were from Sir Howard Grubb's paper in the *Transactions* of the Royal Dublin Society (vol. vii. No. 15). We are indebted to the Society for the use of the illustrations.

The firm of Gustav Fischer, Jena, has begun the publication, in parts, of a new edition of the attractive work on deep-sea exploration entitled "Aus den Tiefen des Weltmeeres," by Prof. C. Chun. Although the original volume was remarkable for the large number of interesting and beautiful pictures, the second edition will contain many new illustrations. The work is one of five which are used as the text for an interesting essay on the methods and results of deep-sea investigations, in the current number of the *Quarterly Review*.

An excellent series of lecture experiments illustrating different types of catalytic reactions is described by Messrs. Noyes and Sammet in vol. xli. of the *Zeitschrift für physikalische Chemie* (pp. 11–27). For convenience, catalysators are divided into seven classes, namely, carriers, absorbent contact-substances, electrolytic contact-substances, water, dissolved electrolytes, enzymes and inorganic colloid substances, and by means of the simple experiments described, the catalytic function of substances belonging to any one of these classes in increasing the velocity of chemical change can be demonstrated to an audience in a very satisfactory manner.

An investigation of the rate of hydrolysis of sulphonic acid esters, published by R. Wegscheider in vol. xli. of the *Zeitschrift für physikalische Chemie*, has shown that this phenomenon is very different in character from that observed with the ordinary carboxylic esters. Whilst the latter are hydrolysed much more rapidly by solutions of acids than by pure water, the hydrogen ion of the acids being supposed to act as a catalytic agent, the hydrolysis of sulphonic acid esters is scarcely accelerated at all by acids. A further study of this subject would no doubt afford valuable information with regard to the essential difference between these two classes of acids.

To the numerous syntheses effected by means of the magnesium alkyl halogen compounds is to be added an extremely elegant method of passing up the series of carboxylic acids. Messrs. Houben and Kesselkaul, in the current number of the *Berichte*, describe the synthesis of carboxylic acids by means of the action of carbon dioxide upon these magnesium compounds. Thus, as an example, ethyl bromide is treated with magnesium in the usual way and a slow stream of carbon dioxide passed in; propionic acid is easily isolated from the product in a yield corresponding to 50 per cent. of the theoretical. Acetic, propionic, benzoic and phenylacetic acids have been synthesised in this way, so that the generality of the method is well established.

At the Municipal Observatory of Montsouris the quantitative examination of atmospheric air has been carried out for a period of twenty-five years. About six years ago some special researches were commenced, under the direction of M. Albert Lévy, by MM. Henriet and Pécoul, the first results of which were presented to the Academy of Sciences in 1898. The fact was announced that atmospheric air which had been perfectly freed from carbon dioxide by an exhaustive treatment with potash and baryta, on circulating repeatedly by means of a mercury circulator through a fresh quantity of baryta, gave appreciable amounts of barium carbonate corresponding to the production of amounts of carbon dioxide of an order nearly approaching, in some cases, the amount of carbon dioxide originally in the air. These facts were so extraordinary that the Academy appointed a commission, consisting of MM. Armand Gautier, Haller and Ad. Carnot, to repeat and report on this work. Their report is published in the current number of the *Comptes rendus*, and they confirm in every particular the views originally stated by MM. Henriet and Pécoul. M. Henriet also publishes in the same number an account of an attempt made to determine the nature of the gaseous substance present in the air capable of giving these results, and comes to the conclusion that there is present in the air of Paris the vapour of a substituted formamide, the slow hydrolysis of which by the baryta furnishes the carbon dioxide originally found.

THE additions to the Zoological Society's Gardens during the past week include a Black Lemur (*Lemur macaco*) from Madagascar, presented by Mr. Thomas Watson; a Hybrid Zebra (between *Equus burchelli* and *E. caballus*) from South Africa, presented by H.M. The King; a Caracal (*Felis caracal*) from South Africa, presented by Regimental Quatermaster-Sergeant Glenton, L.R.; two Javan Peafowls (*Pavo spicifer*) from Burmah, presented by Mr. O. F. Wheeler Cuffe; a —— Ouzel (*Merula*, sp. inc.) from India, presented by Miss Porter; thirteen Slow-worms (*Anguis fragilis*) British, presented by Mr. C. J. Frielander; a Mongoz Lemur (*Lemur mongoz*) from Madagascar, seven Cunningham's Skinks (*Egernia cunninghami*) from Australia, four Amphiumas (*Amphiuma means*), a Corn Snake (*Coluber guttatus*) from North America, two Ruddy Sheldrakes (*Tadorna casarca*) European, deposited; a Wapiti Deer (*Cervus canadensis*, ♂) from North America, purchased.

OUR ASTRONOMICAL COLUMN.

BRIGHT METEOR OF JULY 13.—Several letters referring to observations of the bright meteor of July 13 have been received, in addition to those mentioned last week (p. 281).

Mr. O. J. R. Howarth observed the meteor at Chelsea, his attention being attracted by a flash resembling a very powerful searchlight, of a bluish hue, which lit up the sky and street brightly for an instant. "On turning to discover the cause a trail of light of considerable breadth (perhaps 1°) was observed. It was of serpentine form, about 10° in length, of a granulated appearance, and gradually faded from a bright golden colour, remaining visible from eight to ten seconds. Its elevation was estimated at 60°, and its direction was about S.E. from Chelsea."

Mr. W. Gilles, observing at Deal, says:—"The meteor became visible about 10° S. of the zenith and left a luminous trail of a remarkably sinuous character at its commencement, which was visible for about one minute afterwards."

RADIAL VELOCITY OF THE ORION NEBULA.—In No. 5, vol. xv. of the *Astrophysical Journal*, Prof. H. C. Vogel gives an interesting description of the methods employed, and the results obtained, by Dr. Eberhard and himself in determining the radial velocity of the Orion nebula.

The spectrograms were obtained by Dr. Eberhard with a photographic refractor of the Potsdam Observatory, which has an aperture of 32·5 cm. and a focal length of 343 cm. Owing to the lens not being fully corrected it was impossible to photograph lines of greater wave-length than Hγ. An exposure of 180 minutes, using a three-prism spectrograph, gave a spectrum in which, at Hγ, 0·25 mm. corresponds to a difference of 0·424 $\mu\mu$, whilst an electrical heating apparatus enables the observer to maintain a constant temperature in the prism box within a tenth of a degree for several hours.

Seven spectrograms, taken between November 22, 1901, and February 22, 1902, each showing two iron comparison spectra in addition to the nebula spectrum, gave very uniform results, the mean of which, as measured by both observers, indicates a velocity of recession, relative to the sun, of 17·4 ± 1 km., and this agrees very well with the 17·7 ± 1·28 km. obtained by Keeler as the velocity of this object in his classical researches on the velocities of nebulæ.

Several drawings of the Hγ line which are given plainly indicate the existence of differential velocities in various parts of the nebula.

MOTION OF THE POLE.—In No. 523 of the *Astronomical Journal*, Dr. J. C. Chandler directs attention to the apparent existence of a fifteen months' periodical motion of the pole, which has not yet been identified. This apparent motion is so minute (0″·05) that Dr. Chandler hesitates to assert its real existence, but at the same time he cannot account for the constant differences in the coordinates by any other supposition, and he summarises his article with the following statement:—"In dealing with a phenomenon so obviously complex as these motions of the earth's axis are, and until we are certain of the superior limit of precision in astronomical measurement, it would be unphilosophical to ignore without examination such indications as these."

PHOTOGRAPHS OF THE PERSEIDS IN 1901.—M. J. Sykora communicates to the current number of the *Memorie della Societa degli Spettroscopisti Italiani* the results obtained by the staff of the Jouriew Observatory (Dorpat) in photographing the Perseid trails in August, 1901.

Seven meteor trails were found on the negatives obtained, but of these two were evidently not due to Perseids. Of the remaining five, two were remarkable, inasmuch as they show the explosion of meteors, one in the middle of its trail, the other at the end of its trail; drawings of these accompany the article.

Measurements of the trails in regard to the coordinates obtained from stellar images on the same negatives give the radiant point for August 11 as

$$\alpha = 43^\circ\ 55'\cdot8 \quad \delta = 57^\circ\ 10'\cdot3,$$

whilst the radiant point for August 12 is evidently slightly east of this position.

VARIABLE STARS.—2815 *U Geminorum*.—Mr. J. A. Parkhurst has observed the latest maximum of 2815 U Geminorum with the 12-inch and 40-inch refractors of the Yerkes Observatory, and finds a range of 3·04 magnitudes between April 3 and May 8, the maximum (9·76 m.) being attained at 13·9 h. on April 14.

Mr. Paul A. Yendell, of Dorchester, U.S.A., has made observations of the four following variable stars:—

2279 *T Monocerotis*.—Eleven observations of this star in 1900, and forty-six from December 1, 1901, to April 24, 1902, show four minima and five maxima.

2335 *W Geminorum*.—Fifty-one observations extending from November 24, 1901, to April 28, 1902, indicate five maxima and one minimum.

2509 *ζ Geminorum*.—Four maxima and three minima are deduced from thirty-two observations of this star made between December 27, 1901, and May 2, 1902.

2676 *U Monocerotis*.—Twenty observations from January 13 to April 14, 1902, include a minimum of 7·1 m. on January 30 and a maximum of 6·2 m. on February 12. (*Astronomical Journal*, No. 523).

THE AUGUST METEORIC SHOWER.

LIKE the great majority of meteoric streams, the Perseids return every year, and if they do not compose a really brilliant display they form a very noteworthy shower. An observer attentively watching the firmament on about August 11 may sometimes count 100 meteors in an hour, but the moon must be absent and the atmosphere very clear. In those years when it is most conspicuously exhibited it well repays observation even by those persons who do not specially apply themselves to this department of astronomy. At the close of July and opening of August there are comparatively few Perseids visible, but there is a rich shower of Aquarids at that particular epoch, so that meteors are generally pretty numerous, and occasionally surprisingly so.

Watching for these objects on ordinary nights is sometimes apt to prove tedious even to enthusiasts, but the Perseids are always sufficiently frequent and brilliant on about August 10, 11 and 12 to attract the interested attention of the most casual